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ADDITIONAL STATEMENTS

ON THE SUBJECT

OF THE

RIVER SHANNON

TO THE

REPORTS PUBLISHED IN 1831.

By THOMAS BERMINGHAM, Esq.

OF CARAMANA, KILCONNEL, COUNTY GALWAY, IRELAND.

London:

PRINTED BY S. W. FORES, 41, PICCADILLY.

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A LETTER, &c.

To the Hon. Members of the United Parliament, on the subject of the River Shannon.

In 1831, when Parliament was engaged, exclusively, with the Reform Bill, I got some of the principal landed proprietors to meet at the Thatched House Tavern to consider the state of this River, and the means of improving the Navigation, and the taking of the waters off the adjoining lands: after repeated meetings (having obtained the best opinions within reach at the time,) the Marquis of Downshire in the chair, we determined to wait on Mr. Stanley, the then Secretary for Ireland, with our Report.

This Report, and documents on which it was founded, were published at my expense, by S. W. Fores, 41, Piccadilly; many Members of the House were supplied by me with copies. Mr. Stanley admitted the value of the suggestions in this Report, and allowed the Chairman of the Board of Works, Colonel Burgoyne, who was about to be appointed to that situation, to accompany me along the line of the Shannon. We did so in the autumn of that year, and the consequence has been, that Mr. Rhodes, an Engineer of high eminence, has made a survey of the line from Limerick to Lough Allan, whilst Captain Mudge, R. N. was employed to survey from the mouth of the river to Limerick.

The able survey of Mr. Rhodes is accompanied with an estimate for executing the proposed improvements, amounting to £153,000. The survey made by Captain Mudge is, unfortunately, not accompanied by any estimate. It is most desirable that the estimated cost should be ascertained without delay of this essential part of the navigation.

So far back as 1794, there appears on the face of an old map, now in my possession, made by John Cowan, these memorandums:—

"At the summer assizes, 1794, the High Sheriffs and Grand Juries of the counties of Roscommon, Mayo, Galway, Clare, Limerick, Kings, and Tipperary, resolved, that the completing of the navigation of the River Shannon, and the great rivers adjoining thereto, from Lough Allan to Limerick, would tend effectually to improve and open the home and foreign markets to the produce of more than two millions of acres of land in the heart of the kingdom; and that the execution of this great navigation will effectually advance the commerce, manufacture, agriculture, and population of this kingdom."

SLIEVE NEREN MOUNTAIN.

"This mountain is situated on the east side of Lough Allan, nearly opposite Munterkenny Colliery, and is also pregnant with a very good kind of coal, similar to the above, which, by sinking, may be procured on as easy terms as those on the west side of the said Lough. Here are likewise iron ore in abundance, and several slate quarries."

MUNTERKENNY COLLIERY.

"July 2, 1792—Two pits open; the one eight, the other fifteen yards deep—the vein of coal about two feet thick, the upper part of which being large, round coal, beds upon a small dusty kind—the former sold at the pit's mouth at 8*s.* 8*d.* a ton, and the latter at 5*s.*

"N. B.—These coals being very pleasant, are extremely good for families and smiths. Were the navigation complete to Lough Allan, the whole country down to Limerick may be supplied on easier terms than we purchase from English vessels." Surely this statement should be sufficient, and that no more delay should be allowed to take place in the completing of so desirable a work. But further evidence has been obtained; Mr. Grantham has reported on the benefit of letting off the superfluous waters.

All the bog Reports are filled with statements as to the amount of bog and waste lands kept, from various causes, unimproved, but principally by the action of the water of the River Shannon and its tributary streams. Mr. Rhodes' survey, however, is the best and most able that I have seen; and I have consulted professional men, who all approve of his plan of *weirs* at the Falls, to keep the water all through at a more even level, and preventing the washing away (at these Falls) of the bottom of the river, which extraordinary floods are constantly doing; but when stone weirs are once established, the water can have no effect in wearing away their surface—the effect of these weirs being the keeping the water in summer up to some defined height, and thereby preserving this valuable line of navigation. It is a great mistake to suppose lands very much benefited by water remaining fully six months on them; they would be much more benefited by irrigation for a short period of time, which would be the effect of Mr. Rhodes' recommended improvement.

To the labouring classes in England who (whether right or wrong, I will not now stop to enquire,) conceive that my countrymen, coming as they do (principally from the counties bordering on this river) to labour here, do them an injury by increasing the number of labourers in this market, here is an opportunity afforded of at once employing them at home, and permanently too, as the six millions seven hundred thousand acres, which the ten counties bordering on this river contain, will be more capable of cultivation, after the improvements are effected on this river, and consequently and naturally will absorb in those improvements and cultivation many labourers who now, having no employment in the dead season of the year at home, come over to a better market, which this country affords. But let us attend to the circumstances of this river.

Part of it was in the hands of the Limerick navigation, but now I find that portion is transferred to the Dublin and Liverpool Steam Company; part in the hands of the Grand Canal Company; and part in the hands of Government. There are two canals from the metropolis to this river; one, I believe the Royal, is fallen into the hands of Government—and one in the hands of the Grand Canal Company. There is but one canal uniting with this river on the western side, a distance of about ten or twelve miles, to Ballinasloe. This fact alone is a convincing proof that the present state of the river offers no advantages for communicating with it.

Nor can this be any matter of surprise, when the circumstances of the river, in its present neglected state, is considered. Hear what Lieut. John Tully states in his Report in the printed document before-mentioned:—

"He started with three boats from Killaloe, in June 1821, with about thirty tons each of wheat—*about two-thirds what they could have taken provided there was no want of water, or the navigation had* *been in good order*—encountered some difficulties between Shannon Harbour and Athlone, such *as bad* fords, innumerable detached rocks lying in the very centre of the cut;—he got to Athlone, however, *after a long passage from the state of the river;*—on his arrival at Athlone the three boats (though only drawing three feet six inches) stuck fast in the canal; he had to lighten them considerably to get into Lough Rea; the steamer had to lighten also: at Lanesboro' his troubles only commenced. The canal is filling up fast, the very walls on its banks falling into it. He was obliged to haul out into the lake, to tranship, with great difficulty—and after six days' hard labour he got his boats to Drumsna, where he had to hire two boats to take forty tons out of the boat which was left behind at Lanesboro'; he had to hire a store for a few days at Richmond harbour: he thinks the Government or Directors-General should be called on to pay the expenses incurred. They had a drudge-boat at work last January, when the water was high, now they have none when the water is low, and it might be useful."

Mr. Rhodes details the difficulties his boat met with, with all the advantages of her being well manned: in page 31, in his second Report, printed by order of the House, 10th June, 1833, he says he met a vessel stuck in the canal, belonging to Mr. Farrell, of Cloondrah, bound to Killalloe. Here follows some account of the difficulties this vessel encountered, which is more fully detailed in said Report; left Lough Allan the 29th July. The first place they were stopt at was Battle Bridge—*second time at Carrick, and obliged to unload some;* next stop at Curnacurea; stopt and had to unload at James Town. *She rubbed,* and was delayed by discharges at Rusky Bridge; between Rusky and Clondra obliged to unload, and employ a lighter at Cloneen; *could scarcely get through Clondra canal;* delayed at different places between Clondra and Lanesboro'; were three days unloading and loading at Lanesboro', and had to employ a boat to lighten; stopt at Lanesboro' twelve days with contrary winds; eight days at St. John's Castle, Lough Rea; thirteen days at Bannagher, waiting for the clerk of the quarry; eleven days, with contrary winds, at Lough Derg; they have just returned, 1st October, and had only 18*s.* per ton. The tonnage they had in was 26—and the crew, three men."

Colonel Burgoyne and myself can vouch to the accuracy of those statements from our own observation, and the difficulties we experienced on the voyage we took as before mentioned, with a view of seeing the exact state of the navigation.

Much of the difficulty those vessels experienced will be overcome by Mr. Rhodes' plan of steam-vessels; and although I will never consent to place the whole of the trade of this great river in the hands of any individual, or even in that of any company, I freely admit, that the country is deeply indebted to the late Mr. Grantham, who introduced the first steam-boat on the Shannon; and to Mr. Williams, who has so spiritedly worked out a trade under such discouraging circumstances, and has so clearly and so forcibly brought forward the advantages to be derived from the navigation of this river by ***steam-boats.***

Supposing, then, this river were put by Government in the state in which Mr. Rhodes recommends; also, to be made now a king's river, open to every trader, whether to Sligo, Galway, Limerick, or Dublin. A toll, as at present, of only 1*s.* per ton for a vessel traversing the whole length, would produce a considerable revenue, as goods and passengers could easily navigate the entire Shannon in a day and a half, instead of in about three weeks, the time it takes at present. I feel justified in stating, that the produce on the northern and western side of the river (supposing good roads made to good piers on the river) would come twenty miles, and the eastern and southern side a distance of fifteen to this navigation. Taking the entire length as estimated for by Mr. Rhodes,—one hundred and fifty miles from Lough Allan to Limerick,—you have an area of above three millions of acres, the produce for exportation from which will make its way to this river; but as many of these acres are at present barren (very much owing, however, to the neglected state of the river,) making allowance for these at present unprofitable acres, and also for the consumption at home, I may reasonably count on the produce of one million of these acres making this river the means of getting to the best markets, from which they are at present shut out. In Mr. Holmes' Report, in the pamphlet alluded to, he states his opinion, that "there are two millions of acres within ten miles of the shore of this river, which ought to produce half a ton per acre stock and crop; he says, one-fourth of this would probably go to distant markets, and be carried on an average sixty miles on the navigation." I think the produce of one million of acres, when the improvements contemplated are executed, would go fifty miles on the river; assume half a ton the produce of the acre, we have the enormous quantity of five hundred thousand tons carried to the best markets,—and suppose a toll of one-third the present charge for traversing the whole line, or fourpence per ton, we shall have a revenue of £8,333, after this river was put in a proper state to keep up the works, and go to farther improvements on the river.

By Mr. Rhodes' plan, steam-boats could ply from Limerick to Lough Allan almost daily: this improvement, taken in conjunction with the great western railways, now just about to be commenced, will, no doubt, render Limerick an important port at which to ship Irish produce. These works, besides giving employment, tend to pacify the peeple; and by producing an interchange of inhabitants, must tend to conciliate the countries more than any other measure that Government at the present moment could devise; besides being of material advantage to both countries.

It appears that the Grand Canal Company have almost a complete monopoly of the trade of this river—they have the power of charging 1*s*. per ton for all vessels using that portion of the river under their control; they remit this, I believe, altogether to the traders using their canal, but I do not know that they remit any part of the sum usually charged for carrying on this canal when they get the trader there—they admit that this Company gain SEVEN THOUSAND POUNDS a year from the Shannon trade. As, therefore, the ordinary charge for traversing the whole length of this canal is 10*s*. or 11*s*. a ton tollage, it is clear that the trade is limited to about fourteen thousand tons per annum, and they are said to have most of the trade of the Shannon; besides, by keeping the river navigation in the dilapidated bad state of repair it is in, as will appear from Mr. Rhodes' Report and other statements, they, perhaps, have an increase of trade thereby on their canal, as the only good navigation exists there, except the Royal.

Commissioners should be appointed to watch over this line of navigation, to be chosen by the counties bordering on the river; and in order that the navigation should never be impeded from any want of

Government funds, these counties should be empowered, and required, to make temporary advances, on certain conditions, to keep up the works.

But I am decidedly of opinion that Government should put this great line of navigation in a proper state, and then trust to a small sum as toll, which I have no doubt would be fully adequate to keep up the works and the current expenses.

It should be made imperative on the counties adjacent to the Shannon to make roads to this navigation, and perhaps to make the tributary rivers and the lakes navigable, somewhat upon the principle, I believe, of the Highland roads—half to be advanced by the Treasury, and the other half to be subscribed by individuals, and charged on the counties.

As a measure of police, this work will be worth some regiments of troops. The disturbed districts have been, in many instances, those bordering on this river and its tributaries: I instance more particularly the baronies of Longford, in Galway, and Garrycastle, in the King's County. One of the reasons urged before the Magistrates for placing the district of Longford under the coercion act lately was, that Garrycastle being already under that act, and lying on the opposite side of this river—as the bad, troublesome, characters were hunted from that side, they took refuge in the wild districts on the other; and thus it appeared the barony of Longford became infected, and these characters found a ready asylum in this neglected district.

Let this work be undertaken by Government—let these very characters (now bad, wild, and disorderly) be set to work—the best policeman you can have will be the overseer of this work—employ these men by day, and you need not watch them at night—give them pieces of bargain-work—allow them good fair wages—discourage their drinking whiskey, encourage good beer—and take my word for it, the men of the barony of Longford, and of Garrycastle also, will want coercing as little as any other set of men in any other part of the kingdom.

In a little Tract, published by C. Richards, 100, St. Martin's Lane, Charing-cross, in 1833, as facts for the Labourers' Friend Society, being a short narrative of the home colonies of Castle Sampson and Iskerbane, established upon Lord Clonbrock's estates in the county of Roscommon, in Ireland—*by myself.*

It is therein shown how a turbulent, disorderly peasantry were converted into useful labourers, and are now becoming small and comfortable landholders, in consequence of a judicious expenditure *of time* and money, valuing both at ONE THOUSAND TWO HUNDRED AND ELEVEN POUNDS; that by this expenditure alone sixty families have been rendered *independent*—peace restored to a district that had been greatly agitated—and yet that the improvements made with this expenditure are paying Lord Clonbrock fully six per cent. interest, on the capital thus laid out, by an increased rental, calculated on a liberal scale of lettings.

Am I not justified in my expectations, that if Government will pursue with the river Shannon the same line that Lord Clonbrock took with the estate in question, the same results will follow (his Lordship, observe, made the great leading drain through the estate); and that the consequence will be, and that very shortly, that the people of these disturbed baronies will become, like those of Castle Sampson, peaceable and industrious cultivators of land now almost useless?

The Irish have long been told that the intentions of the people of this country towards them are good—now is the time to show that they have not been deceived:—here is a practical measure coming before you, pass it, and it will be taken as an earnest of your good intentions; and Irishmen will then give credit to what has so often been told them by the friends to the connexion with this great empire—that it is the determination of England, as it is her interest, to assist in the improvements of Ireland.

THOMAS BERMINGHAM.

23, *Dover-street, Piccadilly,*
25th July, 1834.

Printed by S. W. Fores, 41, Piccadilly.

APPENDIX.

THE FOLLOWING LITTLE TRACT, ENTITLED,

PROPOSALS

OF

THE AMERICAN STEAM-CARRIAGE COMPANY,

FOR THE CONSTRUCTION OF

LOCOMOTIVE ENGINES,

&c. &c.

Was sent from America to the Right Honourable Sir JOHN SINCLAIR, Bart., founder of the Board of Agriculture, and with his permission is annexed, by way of Appendix, to this publication, as containing some most important suggestions for the improvements and interests of Ireland, as well as the other divisions of the British Empire.—It is of peculiar importance to Ireland, as the Coal so strongly recommended by Colonel Long, under the name of the Anthracite Coal, is exactly the same as the Kilkenny Coal, which is found in not less than three counties bordering on the River Shannon.

PROPOSALS, &c.

The **American Steam-Carriage Company of Philadelphia**, take leave respectfully to announce to the public, and especially to rail-road companies in the United States, that they have become sole proprietors of certain improvements in the construction of Locomotive Engines, and other rail-way carriages, secured to Colonel S. H. Long, of the United States engineers, by letters patent from the United States; and that they are prepared to receive and execute any orders for Locomotive Engines and Tenders with which they may be favoured, and engage to furnish the same on as favourable terms as engines of the same class can be procured from England.

Having made the necessary arrangements for prosecuting the construction of Steam-Carriages on an extensive scale, they pledge themselves to a punctual compliance with all their engagements in that line of business.

The engines and other carriages to be constructed by them, shall be executed in a workmanlike manner, and will be warranted to fulfil all the conditions realised by the best Locomotive Engines hitherto employed within the limits of the United States.

They have already in their possession patterns and other apparatus adapted to the construction of three classes of engines, viz.: four-ton, five-ton, and six-ton engines: and, on short notice, will be able to supply themselves with apparatus for engines of any other weight that may be required.

In addition to the guarantee already adverted to, in relation to the workmanship, efficiency and durability of the engines, their performance shall be at least as efficient with the use of anthracite coal for fuel, as other engines have been with that of bituminous coal, coke or pine wood. With anthracite coal, the quantity of water evaporated per hour, under a pressure of 90 pounds to the square inch, shall be at least 180 gallons for a four-ton engine, 220 gallons for a five-ton engine, and 260 gallons for a six-ton engine.

The crank-axle of the Pennsylvania Locomoter, being formed in three distinct parts, each of which is furnished with two substantial bearings, no injury or hazard will be incurred from the breaking of a crank, save merely that done to the engine itself. In such an event, the body of the engine will still remain supported on its wheels, and the whole train will be allowed freely to progress on the road, as far as its momentum will carry it.

The performance of the engines, in other respects, shall be in accordance with the statements exhibited in the following tables;

TABLE I.

Performance of a four-ton engine on different grades, at different speeds, and with different loads.

State-ments.	Col. 1.	Col. 2.	Col. 3.	Col. 4.	Col. 5.	Col. 6.	Col. 7.	Col. 8.	Col. 9.	Col. 10.	Col. 11.
	Speed per hr.	Level.	5 feet per m.	10 feet per m.	15 feet per m.	20 feet per m.	25 feet per m.	30 feet per m.	35 feet per m.	40 feet per m.	45 feet per m.
No.	Miles.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1	Slow	60	49.4	42	36.6	32.4	29	26.4	24	22.4	20.6
2	5	30	24.7	21	18.3	16.2	14.5	13.2	12	11.2	10.3
3	10	28	23	19.6	17.1	15.1	13.5	12.3	11.2	10.4	9.6
4	15	25	20.6	17.5	15.3	13.5	12.1	11	10	9.3	8.6
5	20	20	16.5	14	12.2	10.8	9.7	8.8	8	7.4	6.9

TABLE II.

Performance of a five-ton engine on different grades, at different speeds, and with different loads.

Statements.	Col. 1.	Col. 2.	Col. 3.	Col. 4.	Col. 5.	Col. 6.	Col. 7.	Col. 8.	Col. 9.	Col. 10.	Col. 11.
	Speed per hr.	Level.	5 feet per m.	10 feet per m.	15 feet per m.	20 feet per m.	25 feet per m.	30 feet per m.	35 feet per m.	40 feet per m.	45 feet per m.
No.	Miles.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1	Slow	76.8	63.2	54	46.8	41.6	37.2	28.8	31	27.6	26
2	5	38.4	31.6	27	23.4	20.8	18.6	16.9	15.5	13.8	13
3	10	35.8	29.5	25.2	21.9	19.4	17.4	15.8	14.4	12.9	12.2
4	15	32	26.4	22.5	19.6	17.3	15.5	14.1	12.9	11.9	10.7
5	20	25.6	21.1	18	15.6	13.8	12.4	11.3	10.3	9.5	8.5

TABLE III.

Performance of a six-ton engine on different grades, at different speeds, and with different loads.

Statements.	Col. 1.	Col. 2.	Col. 3.	Col. 4.	Col. 5.	Col. 6.	Col. 7.	Col. 8.	Col. 9.	Col. 10.	Col. 11.
	Speed per hr.	Level.	5 feet per m.	10 feet per m.	15 feet per m.	20 feet per m.	25 feet per m.	30 feet per m.	35 feet per m.	40 feet per m.	45 feet per m.
No.	Miles.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1	Slow	96	79.2	67.4	58.6	52	46.6	42.2	38.6	35.6	32.8
2	5	48	39.6	33.7	29.3	26	23.3	21.1	19.3	17.8	16.4
3	10	44.8	36.9	31.5	27.4	24.2	21.7	19.7	18	16.6	15.3
4	15	40	33	28.1	24.4	21.6	19.4	17.6	16.1	14.8	13.7
5	20	32	26.4	22.5	19.6	17.3	15.5	14.1	12.9	11.9	11

EXPLANATIONS OF THE TABLES.

The computations exhibited in the foregoing tables, relate to the performance of engines of different weight, and to various other circumstances, intimated in the titular heading of each table.

The vertical column, headed col. 1, exhibits the rate of speed in miles per hour for which the computations provide. The other columns, headed col. 2, to col. 11, inclusive, exhibit the grade of the road, ascending, in feet per mile, together with the gross load, expressed in tons and parts, that may be conveyed upward, at the various rates of speed presented in col. 1.

The statements are exhibited in series running from left to right, through all the columns of the tables, and are numbered from 1 to 5 on the left of each table. The different statements relate to the different rates of speed, exhibited in col. 1, varying from a speed of two to three miles per hour, which is designated in the tables as "slow," to a speed of twenty miles per hour.

The steam pressure or elasticity contemplated in all the computations, is ninety pounds to the square inch; the effective force of which, in producing locomotion, at the lowest rates of speed, is estimated at 33⅓ per cent. of that pressure.

The series of statements designated No. 1, in each of the tables, exhibit the effective performance as just mentioned, without regard to the condition of the road, with respect to the adhesion between the rails and the wheels of the engine. This performance can only be expected when the road is in a condition to afford the requisite adhesion. With the steam power here contemplated, the wheels will be liable to slip on the rails, when the latter are covered with mud, frost, or snow; but in the best state of the road, such a performance may be effected.

The other statements exhibit the efficiency of the three classes of engines, which may safely be counted on, in all states of the road and weather, frost and snow excepted; it being always understood that the road must be well made, and free from abrupt curvatures.

An inspection of the tables will show the loads that may be drawn on a level road, at different rates of speed, as also the loads that may be drawn upward on different acclivities, and at different rates of speed; and by traversing either table diagonally, the approximate load that may be drawn on a road of various grades, from a level to forty-five feet per mile, may be found: for example, let it be required to determine the load that may be drawn upward on a road, varying in its grades from a level to forty-five feet per mile, by an engine weighing five tons.

In Table No. II, statement No. 2, and col. 11, we have thirteen tons drawn upwards, at the rate of five miles per hour, on an ascent of forty-five feet per mile. In statement No. 3, and col. 10, of the same table, we have 12.9 tons, or about 13 tons, drawn at the rate of ten miles per hour, up an ascent of forty feet per mile. In statement No. 4, col. 9, we have the same load, at a speed of fifteen miles per hour, up an ascent of thirty-five feet per mile; and in statement No. 5, col. 6, we have a little more than thirteen tons, drawn at the rate of twenty miles per hour, up an ascent of twenty feet per mile. In the same table, we find, in statement No. 1, col. 11th, that a five-ton engine, when the road is favourable, is able to draw, up an ascent of forty-five feet per mile, twenty-six tons; and it may be readily inferred, that it is able to draw upwards, on more moderate acclivities, the same load, at increased rates of speed.

By an inspection of Table III. it will appear, that a six-ton engine is able to draw upward, on a road ascending at the rate of forty-five feet per mile, a gross load of nearly thirty-three tons, at a slow speed; also, that with nearly the same load, viz. thirty-two tons, the engine is able to travel at a speed of twenty miles per hour on a level road.

It should, moreover, be remarked, that all the statements, except No. 1, of each table, are considerably within the limits authorised by the power of adhesion between the wheels and the rails, even in the worst state of the road, frost and snow excepted.

The American Steam-Carriage Company feel warranted in assuring the public, and especially those companies or individuals who may favour them with orders for Locomotive Engines, that the foregoing conditions shall be punctually complied with; and that the performance of their engines shall be equal to those exhibited in the tables herein contained.

The subjoined testimonials will explain more fully the character and performance of the engines which this company propose to build.

(Extract from the Journal of the Franklin Institute.)

THE PENNSYLVANIA LOCOMOTER.

PATENTS have been granted to Colonel Long, of the United States army, for "certain improvements in the construction of locomotive and other steam-engines," under the designation with which this article is headed. The numerous experiments which have been made by Colonel Long, with the view of perfecting, and satisfactorily testing the efficiency of his improvements, have been attended with great expense, and have led to the most satisfactory results.

In this communication it is intended to explain some of the more prominent objects of Colonel Long's improvements, and to conclude with a brief recital of some of the practical results accomplished by them.

1st. The successful application of anthracite coal as a fuel for locomotive engines, has been a leading object of the inventor. This object has been attained in the most satisfactory manner, by means of a furnace and boilers of a peculiar construction. The furnace is surrounded by water on all sides, in a manner similar to that adopted in the most approved English locomotive engines, but differs from the latter in the manner of attaching the fire-box to the boilers, and in exposing a much larger comparative boiler surface to the direct action of the heat. The furnace is supplied with a grate of a peculiar construction, which may be made to oscillate at pleasure, on an axle provided for that purpose. By means of the movements thus communicated, the fuel may be speedily discharged from the fire-place, whenever occasion requires it; or may be shaken or agitated in such a manner as to prevent the coal from packing upon the grate-bars, and thereby obstructing the requisite draft into the flues and chimney.

In addition to the fire-box already mentioned, the boiler, or steam generator, consists of two or more cylindrical boilers placed horizontally and lengthwise of the engine. Each cylindrical boiler is furnished with tubular flues, passing longitudinally through that portion of the boiler situated in rear of the fire-place. The heated air, flame, &c. are admitted into these flues through a niche in the cylinder prepared for this purpose, and are conducted through them into a smoke-box and chimney, situated at the back end of the boiler.

In addition to the tubular flues just mentioned, there is a broad and sufficiently copious flue, situated beneath the cylindrical boilers, by means of which the heated air, &c. is brought into contact with the entire lower half, or exterior, of all the cylindrical boilers.

The very extensive boiler surface thus acquired and presented to the action of the heat, contributes to render the production of steam exceedingly copious, while the heat imparted by the fuel is almost entirely absorbed in its production. Such is the efficiency of this arrangement, that in a boiler nine feet and eight inches long, with two cylindrical boilers, each twenty inches in diameter, embraced within that length, the whole weighing, inclusive of all the flues, three thousand pounds, two hundred gallons of water have been evaporated in an hour, under a pressure of ninety pounds to the square inch, and at the expense of two bushels of anthracite coal.

In order to facilitate the combustion, or rather the ignition of the coal, a slip-chimney has been introduced into the engine, by means of which the height of the chimney may be varied at pleasure, from fourteen to twenty feet.

Among the advantages expected to result from this method of constructing boilers, are the exposure of a much larger comparative surface to the action of the heat; a very great reduction of the quantity, or weight, of the water necessary to a minimum supply in the boilers; a similar reduction in the weight of the boilers, as also in the thickness of the metal of which they are composed; together with certain facilities hereafter to be noticed, for removing, renewing, and replacing the boilers, without deranging other parts of the engine.

2d. The steam is employed in the working cylinders in such a manner as will allow of its operating, not only by its absolute, but by its expansive force. This object is effected by means of certain adjustments in the steam-valve apparatus, by the aid of which the entrance of the steam into each of the working cylinders is intercepted, at about five-eighths of the stroke of the piston. The advantages of such an arrangement are too obvious to require a particular designation. It is sufficient to remark, that by this means, three-fifths of the steam generated, are rendered quite as efficient as the whole would be without such an arrangement.

3d. The adoption of wooden wheels, bound with wrought iron, and of such a construction as will admit of tightening the tire, or otherwise repairing it, without materially affecting the relations between the centres and peripheries of the wheels.

It is obvious to any one acquainted with the nature of the materials employed in the construction of wheels, that the iron bands, or tires, of wooden wheels, will expand and contract by the ordinary changes in the temperature of any climate, in such a manner, and to such an extent, as will, sooner or later, render the tire loose upon the fellies. In the wheels of the Pennsylvania locomoter, such a defect is readily remedied by withdrawing the flange-tire and inserting thin iron wedges between the remaining tire and the fellies, without the hazard of producing eccentricity in the wheel.

4th. The construction and application of boxes or bearings for the wheels, or between the carriage frame and the axles, which not only serve as *steps* for the bearing journals of the axles, but as receptacles for the grease, oil, or unguent, necessary for their lubrication. The boxes are of the best hard brass, and are, moreover, adjusted to *bosses* attached to the axle in such a manner as to obviate the use of linchpins, or other apparatus, to confine the axles in their bearings.

5th. The construction of a carriage frame, in a manner to afford the requisite stiffness in the engine, without the necessity of firm and substantial attachments to the boiler, as a means of imparting this essential property to the engine.

It must be manifest to every one conversant with steam-engines, that the ordinary, or rather extraordinary strain produced in boilers by the expansive force of high steam, is all that they ought to be compelled to resist. If to this great strain, that attendant on the concussions of a heavy engine in rapid motion, be added, the liability to explosion is greatly increased, while at the same time, rents and fissures in the joinings of the boilers, of a character seriously to injure the engine, and impair its efficiency, are likely to occur.

The only remedy hitherto devised to corect this difficulty, has been found in increasing the thickness of the metal composing the boilers, which must of course add proportionately to the weight of the engine, without increasing its efficiency. The evil here adverted to, has been far more advantageously remedied in the Pennsylvania locomoter in the way just suggested, viz. by giving to the engine frame the requisite stiffness, without depending on attachments to the boiler for the attainment of this object.

The boilers, instead of being firmly connected with the frame, are merely suspended within it by the intervention of springs, whereby they are exempt from the violent shocks to which other parts of the engine are occasionally exposed. By means of this arrangement, also, the working parts of the engine are relieved from the vibrations and other irregularities calculated to impair the efficiency, and injure those parts of the engine affected by such irregularities.

6th. Lightness in the construction of locomotive engines has been regarded as a leading object of this invention. This object, it is believed, has elicited far less attention from those concerned in rail-roads than it deserves, especially when viewed in connexion with rapid transportation. Strong objections have repeatedly been urged against the employment of light engines, on the ground of their not having sufficient adhesion to the rails, to prevent the wheels from slipping. In reply to such objections, it is proper to observe, that it is very seldom that a gross load weighing more than thirty tons, including passengers, baggage, and cars, is ever offered for rapid conveyance; and that an engine weighing only three tons, has sufficient adhesion to convey such a load, even on a road slightly ascending.

In view of the solidity and texture of the materials of which engines must be composed, it is confidently believed that the greatest economical speed for an engine weighing six tons, will not exceed fifteen miles an hour. It is as confidently believed that a greater speed, with an engine of the weight just mentioned, would be attended with serious injury not only to the engine itself, but to the rails and other parts of the road on which it travels. This being admitted, the inference is fair and conclusive, being grounded on the laws of motion, concussion, &c., by which the movements of heavy bodies are governed, that an engine weighing three tons only, and moving at the rate of thirty miles per hour, will be attended with shocks equally severe, and, consequently, that the *wear and tear* of the engine, rails, &c., will be equal in both cases. Hence, if a speed of thirty miles per hour must be attained, the weight of the engine ought not to exceed three tons. This may be regarded by some, as a mere matter of assumption, yet facts may be adduced, of a character to corroborate and enforce such a conclusion.

Having given the foregoing explanations, touching the objects aimed at in the construction of the Pennsylvania locomoter, the writer will conclude his remarks for the present, by recording a few of the general results drawn from numerous and repeated trials of this engine, on the rail-road leading from Philadelphia to Germantown.

The extent of this road between the two places above mentioned, is six and a half miles. Its ascent from the depot, in Ninth street, to its termination in Germantown, is two hundred and seven feet, or a little more than thirty feet per mile. The steepest ascent, is at the rate of forty-five feet per mile, which occurs in a distance of about half a mile, in Germantown. The road is exceedingly crooked, and the evenness of its surface is much impaired by the settling of embankments, and the consequent derangement of the rail-tracts. The number of trips, outward and returning, performed by the engine, is about eighty; the whole of which were attended with similar results. In no instance has a trip been interrupted for want of sufficient steam; on the contrary, at almost every trip, the fire-door has been thrown open a part of the time, in order to prevent the generation of more steam than could be used.

The only fuel employed was anthracite coal. The quantity consumed in running to Germantown and back again, did not exceed two bushels. The quantity of water evaporated under a pressure of eighty to ninety pounds per square inch, was about two hundred gallons per trip. The engine has repeatedly started with a fresh charge of coal in the furnace, and with a pressure of steam barely sufficient to put the train in motion, yet, on reaching a distance of three or four miles, on an ascending trip, while the train was moving at its greatest speed, the steam was generated in such profusion, as to force open both safety-valves at once.

The results that will now be noticed, all of which relate to ascending or outward trips only, are as follow, viz.

Three passenger-cars, with fifty passengers, were drawn the entire distance in twenty-eight minutes, including two stoppages on account of way passengers.

Three passenger-cars, with sixty-nine passengers, were drawn through the same distance in twenty-six minutes, including four stoppages as above.

Three passenger-cars, with one hundred and twenty-four passengers, were drawn, as above, in twenty-nine minutes, including three stoppages as before.

Two passenger-cars were drawn, as above, in nineteen minutes, the number of passengers being forty.

To these may be added the three following trials, with burden-cars:

A gross load of eleven and a half tons, was conveyed to Germantown in twenty-six minutes.

Six burden-cars, each weighing 28¼ cwt., three of the cars being loaded with stones, gross load, by estimate, twenty-five tons, were conveyed upward on the steepest and most crooked part of the road, the ascent on a part of the distance being at the rate of forty-five feet per mile, at a speed, as nearly as the engineer could judge, of at least twelve miles per hour.

Seven burden-cars, weight as above, two of them loaded with stone, one having about half a ton of iron on board (several workmen rode on the cars), gross load estimated at twenty-five tons, ascended to Germantown in twenty-nine minutes.

On the 4th of July, six trips were made, each with three cars attached. Average time of ascent twenty-five minutes; average number of passengers conveyed, between sixty and seventy.

By a fair comparison with the results of other engines plying on the same road, and propelled by the use of pine wood for fuel,—the cost of coal required to perform a given service, does not exceed one-half that of pine wood for a similar performance,—less than two bushels of the former being of equal efficiency with one-fourth of a cord of the latter.

There is still another consideration which entitles anthracite coal to a decided preference before pine wood, or any other fuel employed in locomotive engines, which is that, in the use of the former, passengers are entirely exempt from the annoyance of smoke, sparks, cinders, &c., which are produced and thrown out in great profusion when other kinds of fuel are employed.

(From the Daily Chronicle.)

The locomotive engine, called the Pennsylvania, invented and patented by Colonel S. H. Long, of the United States army, has been fairly tried and approved on the Germantown rail-road.

Recent experiments have shown that the engine is fit to draw thirty-two tons, easily, on a level road, at the speed of fifteen miles an hour.

The whole weight of the engine is four tons and a half; the boilers evaporate two hundred gallons in an hour, in which time they require the consumption of something less than two bushels of anthracite coal, the only fuel used.

The wheels are made of wood, each with an iron tire of three parallel, concentric, circular bands, cheap in price, but very substantial, strong, lasting, and efficient.

Colonel Long has employed himself, for some time past, on experiments for the application of the heat produced by *anthracite coal* to the production of steam for locomotive engines, and has succeeded in a degree above the most sanguine expectations with which he started. With his arrangement of the furnace and the flue, anthracite coal may be used, for raising steam, *more advantageously than the best pine wood.* It sends forth no sparks to burn or alarm passengers careful of their dresses; and emits no disagreeable or pernicious vapour; *and it enables the director to travel without the incumbrance of a tender, as the fuel and the water are both carried on the engine.*

(From the United States Gazette.)

Colonel Long's engine is now in successful operation on the Philadelphia, Germantown, and Norristown rail-road. Colonel Long deserves great credit for the genius, patience, and unremitting perseverance which he has displayed in bringing into operation this beautiful machine. Its principal merits consist in its light weight, and the consumption, as fuel, of *our anthracite coal.* The engine weighs four tons and three quarters with her fuel and water, carrying no tender, as her water-tanks are on the top of the machine. *Colonel Long has been for a considerable time experimenting on the subject of the use of anthracite coal for fuel, and has met with repeated failures and disappointments.*

This enterprising gentleman, however, not discouraged by these circumstances, persevered, and has at last realised *the complete success of this valuable improvement, which not only obviates the emission of sparks and smoke, but establishes a most economical, and, therefore, highly valuable improvement.* We advise our citizens to examine it. The company deserve credit for the facilities which they have afforded for the development of the invention.

Applications for engines, and all other communications in reference to the subject, will be forwarded to the address of the subscriber in the city of Philadelphia.

By order of the Company,

WILLIAM NORRIS, Secretary.

November 1833.

I have thought it of vast importance to Ireland to give Colonel Long's experiments on Anthracite Coal for steam-engines, as immense quantities of this same kind of coal is raised in the South of Ireland, called the Kilkenny Coal. Should it become generally used for engines, it will induce a trade to a considerable extent, and one which will be of great importance to the Canal and River Shannon navigation.

It is hoped that some of the experiments made by Colonel Long may prove useful to us at home; and the dreadful accident which occurred lately, by the coming off of the wheel from one of the steam-carriages, makes me entertain a hope, that the adoption of Colonel Long's crank-axletree, as detailed in page 20, may prevent such accidents in future.

THOMAS BERMINGHAM.

23, *Dover-street, Piccadilly,*
4th August, 1834.

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